Name _____

Factors Affecting Rate of Photosynthesis

Purpose:

- To determine what factors affect the rate of photosynthesis
- To verify the reactants and products of photosynthesis

Materials:

- *Elodea* (water plant)
- Test tubes and stoppers
- Water
- Bromthymol Blue (BTB)
- Straws
- Colored cellophane
- Aluminum foil
- Light

Brainstorming:

Bromthymol blue is a pH indicator that can also be used to indicate the presence or absence of CO_2.

- How can you use the BTB to determine which substances are produced or given off during photosynthesis?
  - Yellow indicates:
  - Blue indicates:

Class Procedure:

1. Record the original color of water that will be placed in each test tube.
2. Fill Beakers A and B with about 150mL of water.
3. Add 1 dropper of BTB to the water in both beakers to turn the water blue.
4. Use the straw to add carbon dioxide to Beaker A until the water turns yellow.
5. Pour the water from Beaker A into test tubes 1, 3, 5, 7, 9, 10, 11.
6. Pour the water from Beaker B into test tubes 2, 4, 6, 8.
7. Cover the outside of test tubes 3, 4, 7, 8 with aluminum foil.
8. Cover the outside of test tubes 9, 10, 11 with the appropriate colored cellophane.
9. Add *Elodea* to test tubes 5, 6, 7, 8, 9, 10, 11.
10. Stopper the tubes.
11. Record your predictions under the "expected" column of the data table.
12. Let the test tubes sit overnight under light.
13. Record results in "observed" column of the data table and complete their interpretation.

Data:

Mixture				Solution Color			Interpretation of Observed Results
#	*Elodea*	CO_2	Light	Orig.	Exp.	Obs.	
1	-	+	white				
2	-	-	white				
3	-	+	dark				
4	-	-	dark				
5	+	+	white				
6	+	-	white				
7	+	+	dark				
8	+	-	dark				
9	+	+	red				
10	+	+	green				
11	+	+	blue				

Analysis:

1. Why didn't we add Elodea plants to test tubes #1-4? What can we learn from tubes #1-4?

2. Of tubes #5-8, which 2 tubes show evidence that light is necessary for a plant to carry on photosynthesis? Explain

3. Of tubes #5-8, which 2 tubes show evidence that plants must use carbon dioxide during photosynthesis? Explain

4. Which tube (#) shows evidence that plants also produce carbon dioxide, even when they are not carrying on photosynthesis? Explain

5. Compare test tubes #9-11. Under what color of light does there seem to be the lowest rate of photosynthesis? Explain

Conclusions:

On the back of this page, write at least **5 sentences** describing what you have learned and/or confirmed about the processes by which plants produce and use sugars. In your explanation, be sure to include the following specifics:

- What is the names of the process by which plants
  - Produce sugars?
  - Use sugars?
- What gases are produced in EACH process?
- What gases are consumed in EACH process?
- From where does the plant get the energy needed to produce sugars?
- What other factor that we investigated in this lab also affects the rate of this process?